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(54) Torque overload control system

(57) A control system 1 for overload protection of a drive shaft comprises a dog tooth coupling 2 having interposed between the drive and driven teeth 12, 14 elastomeric blocks 16 carrying a contact ring 18 associated with a microswitch 20 connected to a logic control unit 24. Distortion of the blocks 16 due to a torque overload condition actuates the microswitch 20 through the contact ring, thus stopping the coupling drive via a control unit 24.

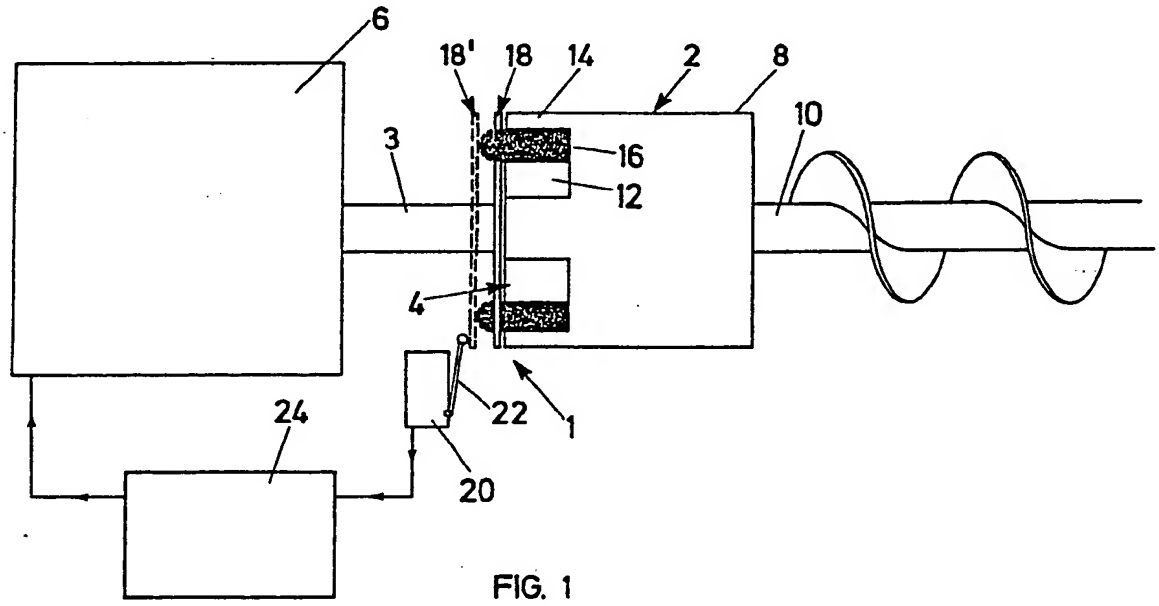

FIG. 1

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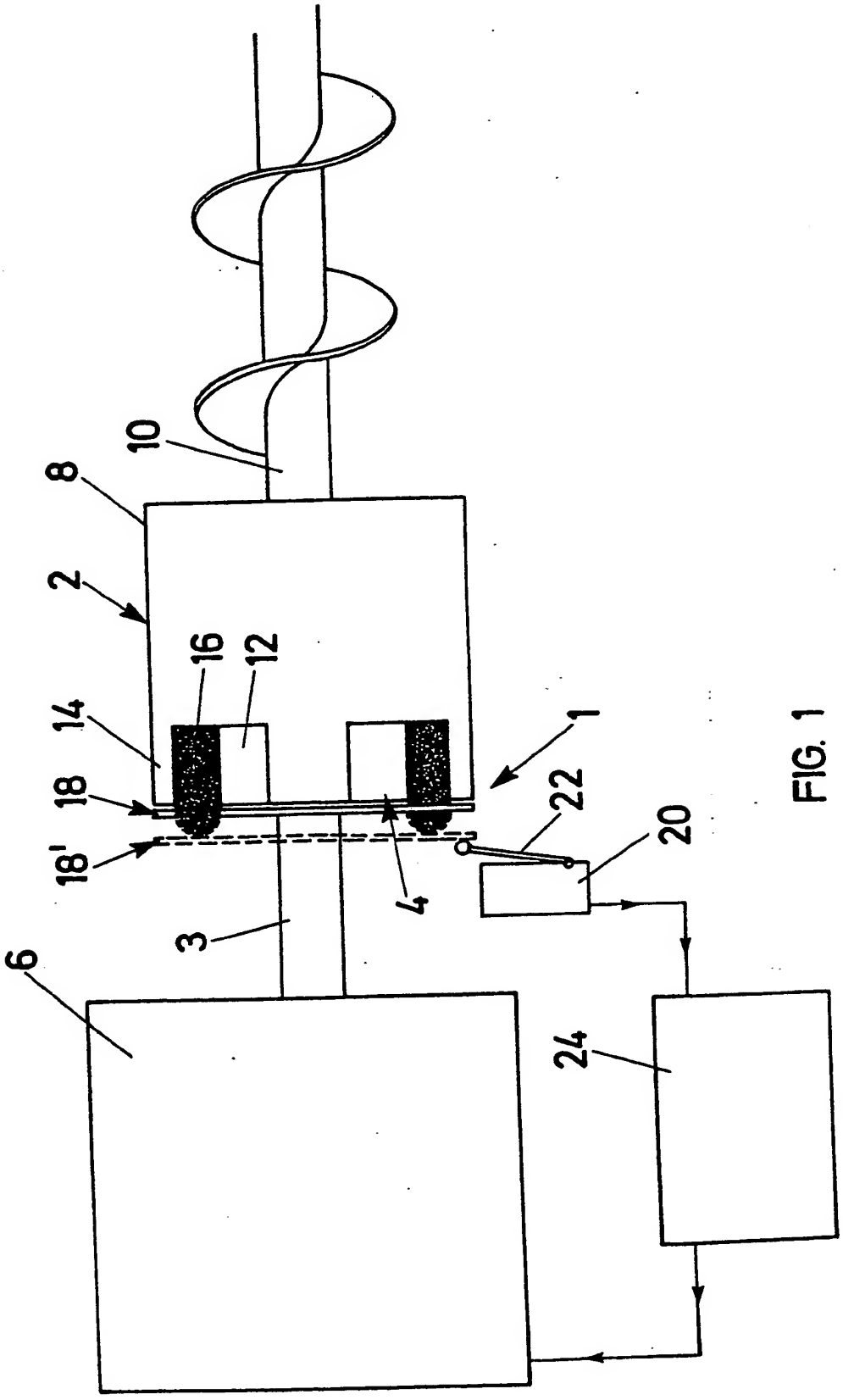

FIG. 1

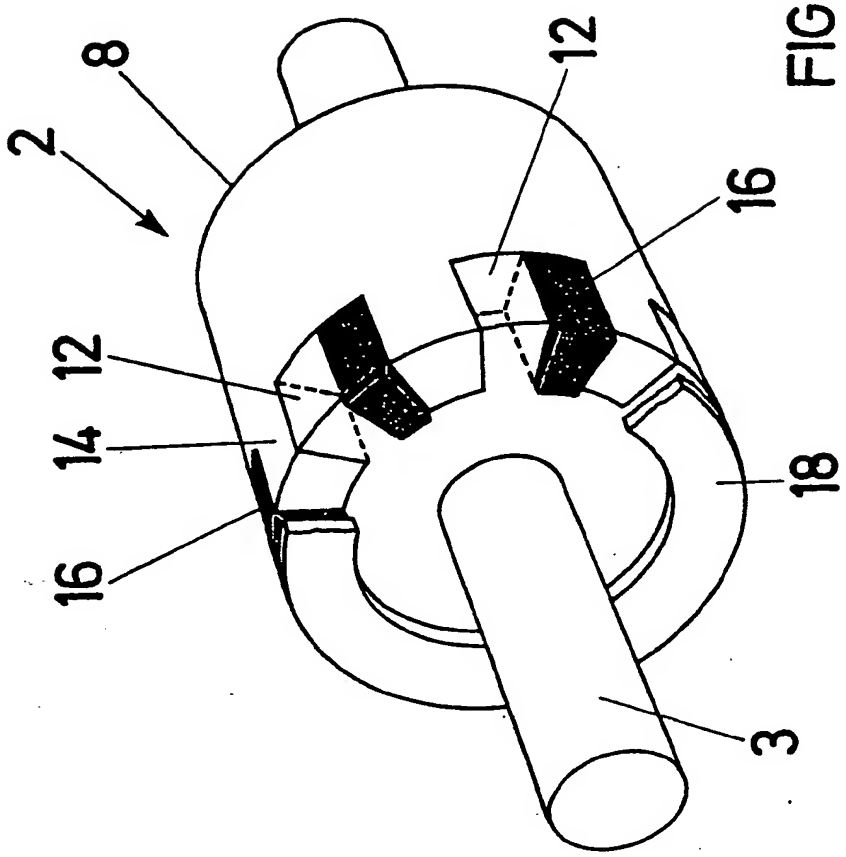

FIG 2

SPECIFICATION

Control systems

This invention concerns a control system.

In particular, but not exclusively, the present invention has reference to a control system for controlling the rotation of a shaft in accordance with the torque.

When a shaft is employed to drive a load, for example the conveying screw for transporting particulate material, the torque varies dependent upon the magnitude of that load and it is important to ensure that a predetermined limit is not exceeded. Various types of overload protection devices are known and have been used with effect over the years. Perhaps one of the simplest involves using shear pins which fail upon attainment of the predetermined torque limit. The disadvantage of employing such an arrangement is the work necessarily involved in replacing the shear pins as this is time consuming and can prove difficult. Furthermore, there is no automatic cut-off for the drive motor.

An object of the present invention is to provide a simple and yet effective control system.

Accordingly, the invention provides a control system including a coupling for a rotatable shaft, the coupling having a drive member and a driven member, an elastomeric element interposed between the drive and driven members, and a trip mechanism associated with the element and actuable thereby upon attainment of a predetermined torque in the shaft.

The elastomeric element may be of any material deformable in a plane perpendicular to an applied force. For example, the material may be rubber or a spring steel ring or any equivalent thereof.

The coupling may conveniently be in the form of a dog drive and the elastomeric element may comprise a number of blocks disposed in abutting relationship with the teeth of the drive and driven members.

A contact ring may be attached to the free faces of the elastomeric element blocks or held against the faces by a spring.

The trip mechanism may be a microswitch connected to a logic control unit which is in turn used to control a drive motor with the rotatable shaft carrying the drive member of the coupling.

The logic control unit is designed in such a way that after receiving a trip signal from the microswitch to switch off the drive motor, indicating the attainment of a predetermined torque on the shaft, the unit then switches the drive motor into reverse for a preset time, thus affording the opportunity for the cause of the high torque to be removed. The unit then automatically switches the motor back to its original direction. If the cause of the high torque is not removed by reverse running after the first attempt, the unit will allow two further attempts to be made automatically by reverse running. If failure again results, power to the motor is cut off until the cause is removed manually. Once removal has been effected, the control unit is reset.

By way of example only, one form of control system according to the invention is described below with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic arrangement of the system; and

Figure 2 is a perspective view of the coupling.

Referring to the drawings, a control system indicated by the numeral 1 consists of a dog tooth coupling 2 the drive member 4 of which is connected to shaft 3 of an electric motor 6. The driven member 8 of the coupling is connected to a conveying screw 10 of a screw conveyor employed for example to feed particulate coal into a stoker, particularly an underfeed stoker. The drive and driven members 4, 8 of coupling 2 have interspersed in abutting relationship between their respective teeth 12, 14 blocks 16 of rubber or other elastomeric material which carry a contact ring 18.

A microscitch 20 is disposed in close adjacency to the ring 18 which is capable of contacting the actuating arm 22 of the microscitch. The microswitch 20 is connected to a logic control unit 24 which is in turn arranged for the control of the electric motor 6.

In operation, the conveying screw 10 is driven by motor 6 through the shaft 3 and coupling 2. If there should be a blockage of the screw 10, caused for example by tramp material, the torque will increase and in so doing the blocks 16 of elastomeric material will distort this causing the contact ring 18 to move axially. The ring 18 in its actuating position, shown in ghosted outline at 18' in Figure 1, operates the microswitch 20 which through the control unit 24 stops the motor 6 and thereafter reverses polarity such that the motor 6 can be driven in the opposite direction to try to free the blockage. The reverse running of motor 6 is initiated by the control unit and continues for a preset time, therafter normal rotation is restored. If the cause of the blockage is not removed by the reverse rotation and the torque increase again occasions the microswitch to trip out, the unit will repeat the reverse running twice more before finally cutting off power to the motor 6. Thereafter the blockage must be removed manually.

The control system of the present invention thus provides a simple amnd yet effective means of protection against overload by utilising the distortion characteristics of elastomeric material.

The control system can also be employed for measuring torque of a rotating shaft, and this application can be achieved by monitoring the displacement of the elastomeric element. Since this is related to the applied torque.

CLAIMS

1. A control system including a coupling for a rotatable shaft, the coupling having a drive member and a driven member, an elastomeric element interposed between the drive and driven members, and a trip mechanism associated with the element and actuable thereby upon attainment of a predetermined torque in the shaft.

2. A system according to claim 1 in which the coupling is in the form of a dog drive and the

elastomeric element comprises a number of blocks in abutting relationship between respective teeth of the drive and driven members.

3. A system according to claim 2 in which a contact ring is attached to the free faces of the blocks of the elastomeric element.

4. A system according to any one of the preceding claims in which the trip mechanism is a microswitch.

5. A system according to claim 4 in which the microswitch is connected to a logic control unit adapted to control a drive motor for the rotatable shaft.

6. A control system substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.

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